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Optimizing delivery of mobility for intubated patients

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We appreciate the letter from Yasuda, et al (1) and acknowledge the excellent points raised. The authors questioned the impact of ICU structural variation on our observed ARDS Network mobility point prevalence estimates (2). They appropriately note the increasing importance of ICU variability and "culture" on provision of early mobilization (3). Our work across a cohort of Washington State ICUs found that hospital-level factors including presence of an ICU activity protocol, larger hospital volume and teaching affiliation are significant predictors of perceived delivery of higher-level mobility (4). In our ARDS Network cohort, we did not collect granular data on hospital-level factors given our primary interest in patient-level predictors. We agree that future mobility studies should incorporate both hospital- and patient-level factors. Such studies could consider designs shown effective for implementation of other ICU interventions including end-of-life care comparing high- and low-performing ICUs to identify structural and patient variations that optimize mobility delivery (5).

Yusada raised the question to what degree excessive sedation or coma contributed to our observed results. In our cohort, presence of a coma (RASS -4 or -5) was significantly negatively associated with receipt of higher-level mobility (adjusted OR 0.05, 95% CI 0.01 to 0.40, p=0.02). Increasing studies suggest the importance of sedation and delirium assessment for mobility success. Miller, et. al noted that hospitals who implemented mobility in concert with sedation and delirium assessments were 3.5 times more likely to achieve higher-level mobility (6). Our data support the notion that sedation, delirium and mobility are intrinsically linked and that interventions targeting mobility should simultaneously address sedation and delirium.

Yusada noted that weight was an important predictor of mobility in our cohort. Obesity in the ICU is an increasing issue and this was reflected in our cohort with 40% of the patients

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meeting CDC criteria for obesity (BMI >30). In unadjusted models, weight was significantly associated with achieving out-of-bed mobility (p=0.001). In our adjusted model for patients ventilated via an endotracheal tube, each kilogram of weight was associated with a statistically insignificant 3% decrease in the likelihood of achieving higher-level activity. Total weight rather than BMI was more predictive of mobility progression. This may reflect the need for specialized equipment and increased manpower for patients with greater weight. Weight is likely an important predictor of mobility in our ICU patients and future studies should attempt to understand the complexities of mobilizing obese patients.

Finally, Yusada questioned whether mode of mechanical ventilation and days of mechanical ventilation impact mobility delivery. Little is known regarding the relationship between mode of ventilation and mobility or whether sedation and delirium are in the causal pathway between ventilation and mobilization. We did not collect this data in our current study, although we did observe a clear relationship between type of airway and mobility with presence of an endotracheal tube predicting lower mobility progression (Supplemental Figure 2) (2); these results should be studied further. Overall, there are many aspects of ICU care that may directly or indirectly affect provision of mobility—future studies are certainly warranted.

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